Brain Therapies and Treatments of the 21st Century

Fixing Broken Brains

A Smithsonian Institution Resident Associates Program Campus on the Mall Seminar

April 17 – June 15, 2000
Monday evenings at 8:00

April 17	Overview of neuronal development -- what can go wrong? Douglas Meinecke, Program Director, Molecular and Cellular Basis of Schizophrenia, Mood, and other Brain Disorders, NIMH, NIH
April 24	Asylums: Past Present and Future *Serious Mental Illness in the United States* Wayne Fenton, Deputy Director for Clinical Affairs, NIMH
May 1	Pharmacotherapy -- the use of drugs to combat brain disorders Dennis S. Charney, Professor of Psychiatry, Yale University, and Director, National Center for Post-Traumatic Stress Disorder, USVA, West Haven, CT.
May 8	Changing function of the brain with surgery – *from destructive resection to adaptive control* Steven Schiff, Krasnow Professor of Neurobiology and Professor of Psychology The George Mason University, Fairfax, VA
May 15	Gene therapy on the horizon W. French Anderson, Director, Gene Therapy Laboratories, and Professor of Biochemistry and Pediatrics, University of Southern California School of Medicine
May 22	Stem cells -- primordial brain cells to the rescue? Arlene Y. Chiu, Program Director, Spinal Cord Injury and Repair NINDS, NIH
May 29	Memorial Day – Holiday (no lecture)
June 5	Population coding -- from deciphering the neural code to robotics John Donoghue, Ph.D. Professor of Neuroscience, Brown University
June 12	Toward replacement parts for the brain Theodore W. Berger, Professor of Biomedical Engineering University of Southern California

Dr. W. French Anderson's research is focused on developing advanced gene therapy delivery systems, specifically, to design virus-based vectors that can be injected directly into patients in order to accomplish gene transfer. The long-term goal is to engineer vectors that would target the correct tissue, insert into a safe site in the genome, and be regulated by normal physiological signals. The initial objectives are : a) to study retrovirus/receptor interactions in order to learn how to make retroviral vectors that can target a specific tissue (*e.g.*, cancer and hematopoietic stem cells) and b) to study the mechanism of gene regulation in order to optimize the expression of transferred genes in targeted cancer cells and hematopoietic stem cells.

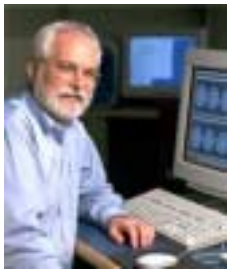
The research of **Dr. Theodore W. Berger** involves the complementary use of experimental and theoretical approaches to developing biologically constrained mathematical models of mammalian neural systems. The focus of the majority of current research is the hippocampus, a neural system essential for learning and memory functions. The goal of this research is to address three general issues: (1) the relation between cellular/molecular processes, systems-level functions, and learned behavior; (2) the extent of which the functional dynamics of neural systems are altered by activity-dependent synaptic plasticity; (3) the extent to which the essential functions of a neural system can be incorporated within a hardware representation (e.g., VLSI circuitry).

Dr. Dennis S. Charney - There is increasing knowledge of the neurobiological substrates of major psychiatric disorders. Using pharmacological and brain imaging techniques, specific pathophysiologic abnormalities in brain monoamine systems have been identified in patients with major depression, schizophrenia, panic disorder, and post traumatic stress disorder. Current research projects are focusing on the role of brain monoamine and neuropeptide function in these conditions and the testing of novel pharmacological treatments.

Dr. Arlene Chiu is program director for spinal cord injury and repair at the National Institute of Neurological Disorders and Stroke, NIH. The mission of the NINDS is to reduce the burden of neurological disease—a burden borne by every age group, by every segment of society, by people all over the world. Dr.Chiu's group has responsibility for administering a portfolio of research grants:

- ✶ to elucidate mechanisms of synapse formation,
- ✶ to restore function in neurologically disabled individuals, and
- ✶ to encourage development of stem cell biology to repair the injured nervous system.

Dr. John Donoghue's research focuses on understanding how the brain encodes and manipulates vast amounts of complex information. His research is directed at understanding the form of higher level information coding in the cerebral neocortex. In this work he and his group study the activities of populations of cortical neurons using multi-electrode arrays in primates as they learn and perform visually guided behaviors. He is working with investigators at the University of Utah to develop novel electrode arrays that can be implanted long-term in the cortex of monkeys and used to record tens to hundreds of neurons simultaneously. They then study how the temporal and spatial properties of these populations are changed when a new visually guided motor task is learned and performed.



Dr. Wayne Fenton was recently medical director and director of research at Chestnut Lodge Hospital in Rockville, MD, and is now Deputy Director for Clinical Affairs in The Division of Mental Disorders, Behavioral Research and AIDS (DMDBA) at the National Institute of Mental Health, NIH, in Bethesda, MD. DMDBA supports research and research training related to behavioral, developmental, epidemiologic and intervention development studies on the causes, prevention, and treatment of mental and behavioral disorders and HIV/AIDS.

Dr. Douglas L. Meinecke is Chief of the Molecular and Cellular Basis of Schizophrenia, Mood, and other Brain Disorders Program at the National Institute of Mental Health. This program supports research into the alterations in molecular and cellular aspects of brain function that are responsible for complex mental disorders such as schizophrenia, mood disorders, *etc*. The major goal of the program is to translate and integrate findings from basic cellular and molecular neuroscience into clinical investigations in order to develop and test specific hypotheses about the neurobiological substrates and etiologies of complex mental disorders.

Dr. Steven J. Schiff is the chief of the Neural Dynamics Laboratory. His research interests include applying advances in nonlinear dynamics to understanding the dynamics of neuronal ensembles, modulating the dynamics with electric fields, and in control of epilepsy. The Neural Dynamics Laboratory is a multidisciplinary research group developing and utilizing advances in experimental nonlinear physics and mathematical techniques in dynamical systems theory to address questions at the forefront of neurobiology. He is specifically interested in the emergence of collective behavior across the various scales of neuronal organization, from individual neurons to small ensembles, up through the entire brain. In particular, he seeks to understand the dynamical linkage among individual neurons or ensembles at a particular scale as well as the linkages between scales.